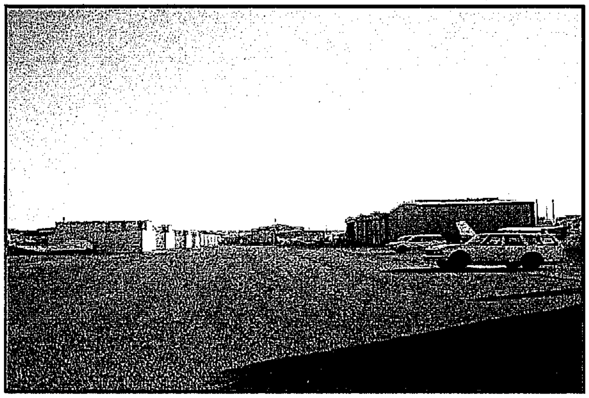
Chapter Three
FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

An updated set of planning horizon milestones of aviation demand for Laughlin-Bullhead International Airport (IFP) were established in the previous chapter. These activity milestones include passenger enplanements, aircraft operations, based aircraft, fleet mix, and peaking characteristics. With this information, specific components of the airfield and landside system can be evaluated to determine their capability to accommodate future demand.

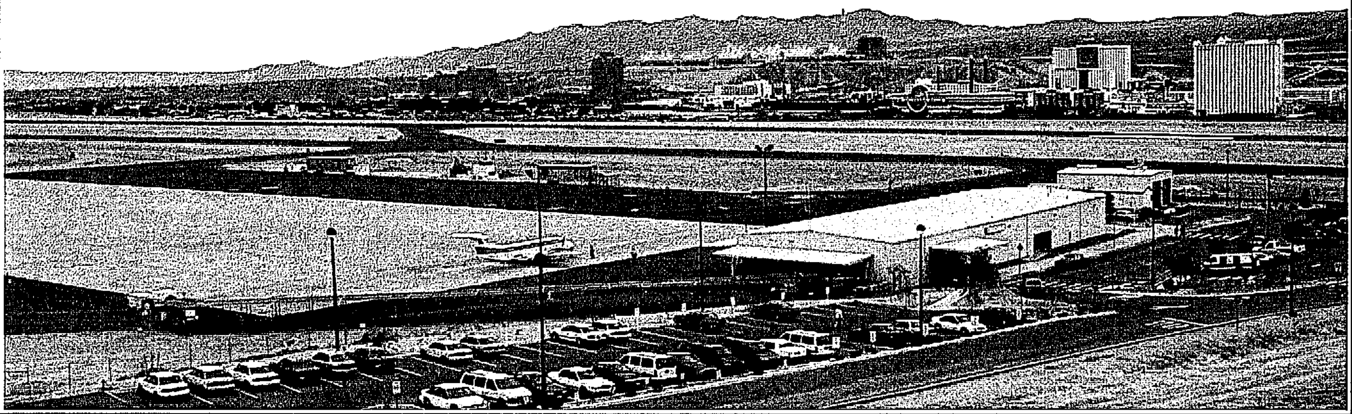
In this chapter, existing components of the airport are evaluated so that the capacities of the overall system are identified. Once identified, the existing capacity is compared to the planning horizon milestones to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the approximate sizing and timing of the new facilities can be made.

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. The components include:



- Runways
- Taxiways
- Navigational Approach Aids
- Airfield Lighting, Marking, and Signage

Landside facilities are needed for the interface between air and ground transportation modes. This includes components for commercial service and general aviation needs such as:



- Passenger Airline Terminal
- Air Cargo Facilities
- General Aviation Terminal
- Aircraft Hangars
- Aircraft Parking Aprons
- Auto Parking and Access
- Airport Support Facilities

The analysis begins with an evaluation of the operational capacity of the airfield.

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** of a runway measures the maximum number of aircraft that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given time frame.

FAA Advisory Circular 150/5060-5 **Airport Capacity and Delay** provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to IFP:

- **Runway Configuration** - A single runway configuration with a full length parallel taxiway, and an instrument approach from the south.

- **Runway Use** - Runway 16 is used 66 percent of the time. Runway 34 is used 34 percent of the time including the two percent IFR conditions.

- **Exit Taxiways** - Based upon mix, only taxiways between 2,000 and 4,000 feet count in the exit rating. For Runway 16 the exit rating is one, while Runway 34 has an exit rating of two.

- **Weather Conditions** - The airport operates under visual flight rules 98 percent of the time.

- **Aircraft Mix** - Description of the classifications and the percentage mix for each planning horizon is presented on **Table 3A**.

- **Percent Arrivals** - Generally follows the typical 50 percent split.

- **Touch-and-Go Activity** - Percentages of touch-and-go activity are presented in **Table 3A**.

- **Operational Levels** - Operational planning horizons were outlined in the previous chapter. The peak month averages 10.5 percent of the year, and the peak hour averages 15 percent of the operations in a day.

HOURLY RUNWAY CAPACITY

Based upon the input factors, current and future hourly capacities for the various operational scenarios at

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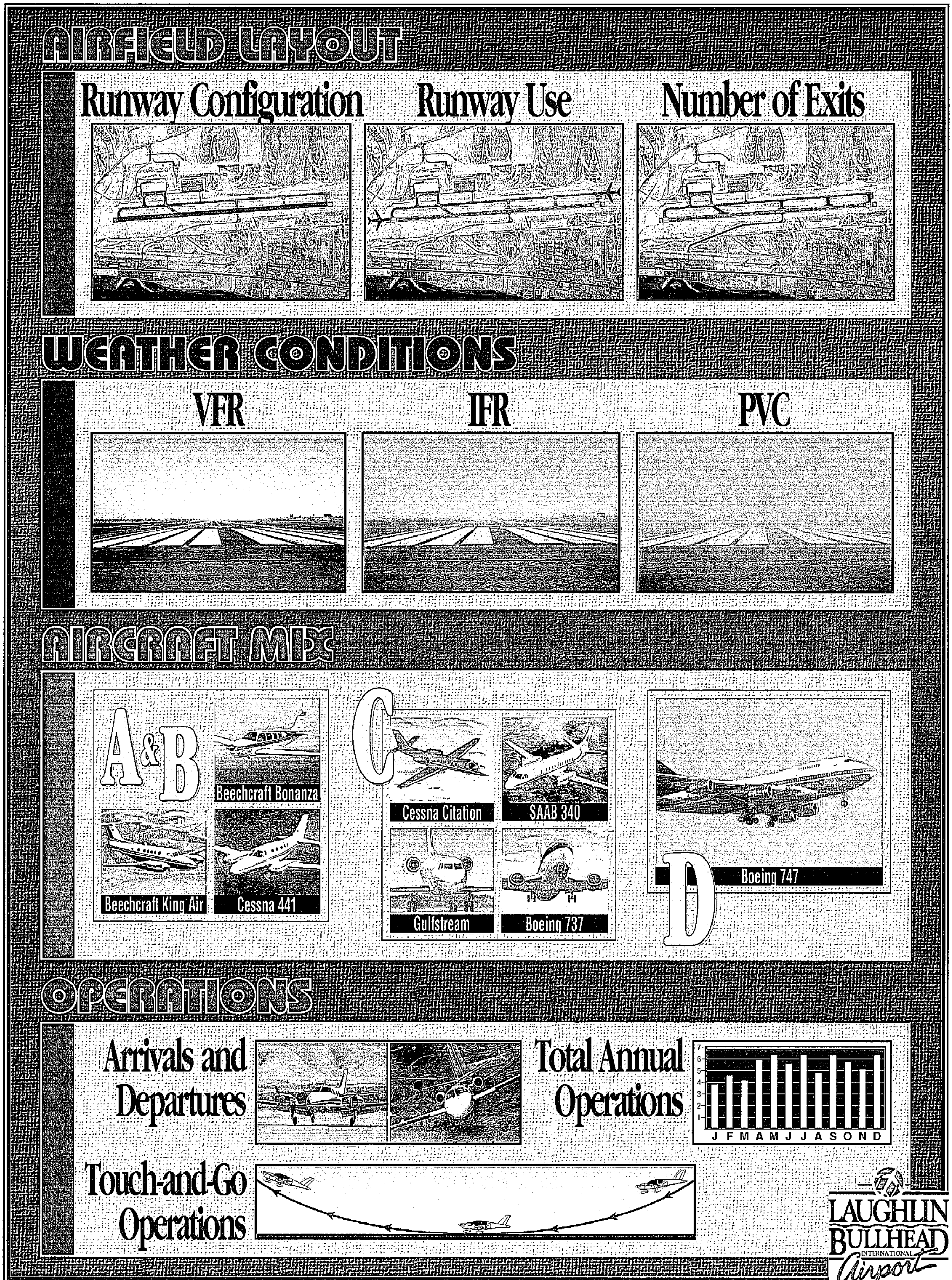

Exhibit 3A
AIRFIELD CAPACITY FACTORS

TABLE 3A Aircraft Operational Mix Laughlin/Bullhead International Airport				
Aircraft Classification	Current	Short Term	Intermediate Term	Long Range
Class A	68%	63%	61%	59%
Class B	23%	22%	23%	23%
Class C	9%	15%	16%	17%
Class D	0%	0%	0%	1%
Touch-and-Go's	21%	20%	20%	19%

Definitions:

- Class A: Small single-engine aircraft with gross weight of 12,500 pounds or less.
- Class B: Small twin-engine aircraft with gross weight of 12,500 pounds or less.
- Class C: Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds.
- Class D: Large aircraft with gross weights over 300,000 pounds.

Laughlin-Bullhead International Airport are presented on **Exhibit 3B**. A north operational flow using Runway 34 offers the highest hourly capacity today (96 operations). This is due to the higher exit rating for this runway direction. During IFR, the hourly capacity of the runway drops to just 29 operations per hour. This is due to increased spacings required between aircraft and the lack of radar below 6,000 feet mean sea level (MSL).

As the mix of aircraft operating at an airport changes to include a higher percentage of large aircraft (weighing over 12,500 pounds), the hourly capacity of the system declines. As indicated on **Table 3A**, the percentages of Class C and D aircraft will increase with the planning horizon activity milestones. This results in the decline in VFR hourly capacity depicted on **Exhibit 3B.**

The weighted hourly capacity reflects the average capacity of the airfield taking into account VFR, IFR, and PVC conditions. At Laughlin-Bullhead International Airport, the current weighted hourly capacity is 86 operations. The current and future weighted hourly capacity is depicted in **Table 3B.**

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity
D = ratio of annual demand to the average daily demand during the peak month

H = ration of average daily demand to the design hour demand during the peak month

The ratio of annual demand to average daily demand (D) was determined to be 295 for IFP. This is expected to remain relatively constant over the long range planning period. The ratio of average daily demand to average peak hour demand (H) was determined to be 6.7. This ratio was also projected to remain relatively constant at IFP.

TABLE 3B
Airfield Demand/Capacity Summary
Laughlin/Bullhead International Airport

	Milestone Airfield Capacity Delay					
Planning Horizon	**Annual Operations**	**Design Hour**	**Annual Service Volume**	**Weighted Hourly Capacity**	**Avg. per Operation (min.)**	**Total Annual Hours**
Current	55,686	30	170,000	86.0	0.20	186
Short Term	77,700	40	155,000	78.3	0.35	453
Intermediate	97,000	50	151,000	76.4	0.55	889
Long Range	127,800	65	140,000	70.8	1.40	2,982

The current ASV was determined to be 170,000 operations. As mentioned earlier, the percentage of Class C and D aircraft utilizing the airport is expected to increase as activity increases. This will result in a decline in the annual service volume as operations increase to 140,000 over the long range. With operations in 1998 totaling 56,000, the airport is currently at 33 percent of its annual service volume. Long range annual operations are forecast to reach nearly 128,000 operations which would be over 90 percent of the airport's ASV. **Table 3B** summarizes the airport's ASV over the long range planning horizon.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside of the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.

Table 3B summarizes the aircraft delay analysis conducted for Laughlin-Bullhead International Airport. Current annual delay is a minimal 186 hours. As an airport's operations increase towards its annual service volume, delay increases exponentially. Analysis of delay factors for the long range planning horizon indicate that annual delay can be expected to reach nearly 3,000 hours.

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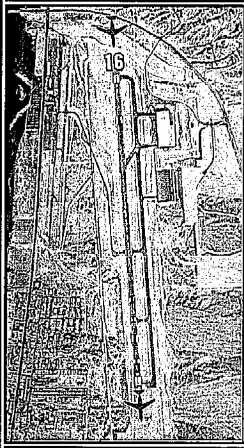
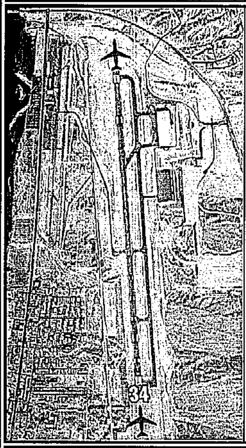
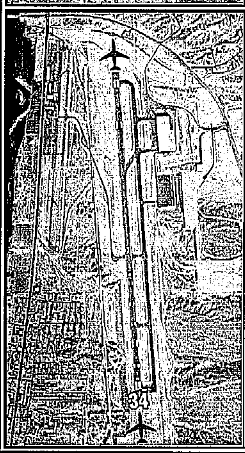
TRAFFIC FLOW	WEATHER	RUNWAY IN USE	% OF YEAR	HOURLY CAPACITY
	VFR	16 (South Flow)	66.0	Current: 88 Short: 80 Inter.: 78 Long: 72
	VFR	34 (North Flow)	32.0	Current: 96 Short: 87 Inter.: 85 Long: 79
	IFR	34 (North Flow)	2.0	Current: 29 Short: 29 Inter.: 29 Long: 29

LAUGHLIN BULLHEAD INTERNATIONAL Airport

Exhibit 3B
RUNWAY USE SCENARIOS/
HOURLY CAPACITY

CAPACITY ANALYSIS CONCLUSIONS

Exhibit 3C compares annual service volume to existing and forecast operational levels at Laughlin-Bullhead International Airport. The current operations level of 56,000 represents 33 percent of the airfield's annual service volume. By the end of the planning period total annual operations are expected to represent 91 percent of annual service volume.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (*NPIAS*), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 percent of the annual service volume. This would be exceeded by the intermediate planning horizon of 97,000 annual operations. Thus, airfield capacity improvements will need to be considered.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use the airport. The critical design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 operations per year from the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the long range potential needs of the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC), has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADG's used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

Exhibit 3D summarizes representative aircraft by ARC.

In order to determine several airfield design requirements, the critical aircraft and critical ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Laughlin-Bullhead International Airport. **Table 3C** provides a projected breakdown of planning horizon operations by airport reference code.

TABLE 3C
Airport Reference Code Mix
Laughlin/Bullhead International Airport

	Annual Operations			
Reference Code	**Current**	**Short Term**	**Intermediate Term**	**Long Range**
A-I	36,797	46,700	57,000	71,700
B-I	11,656	15,740	19,905	26,570
B-II	4,788	9,740	10,585	11,675
B-III	0	0	750	1,875
C-I	210	390	600	990
C-II	150	290	1,140	2,430
C-III	505	2,300	3,500	6,700
C-IV	0	90	160	560
D-I	90	170	260	430
D-II	90	170	260	430
D-III	0	0	0	0
D-IV	0	10	40	240
Rotorcraft	1,400	2,100	2,800	4,200
Totals	55,686	77,700	97,000	127,800

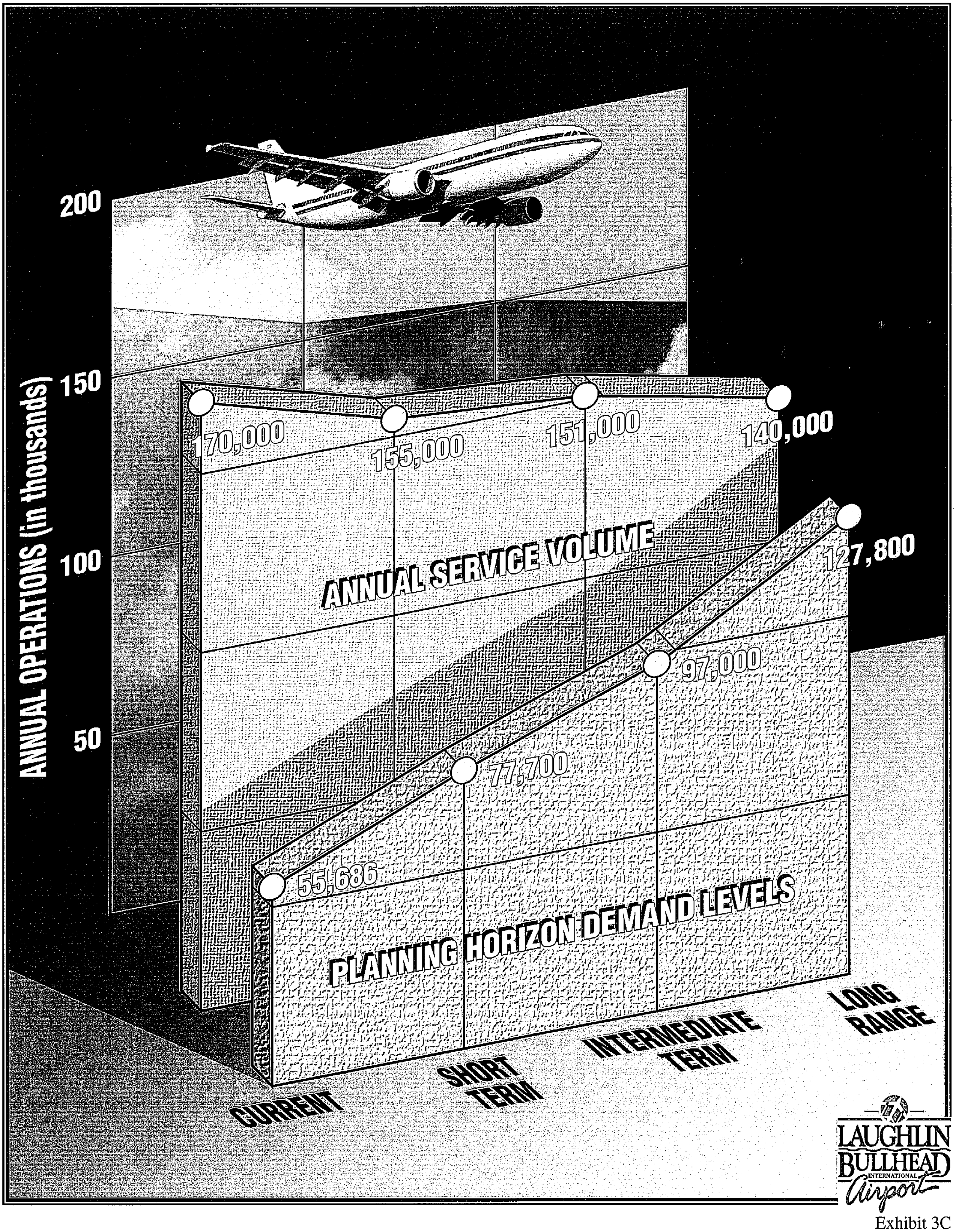


Exhibit 3C
AIRFIELD DEMAND VS. CAPACITY

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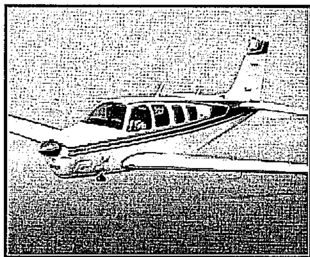
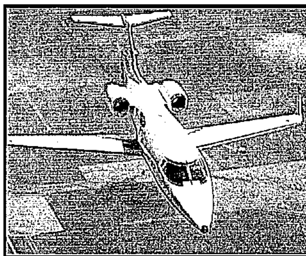


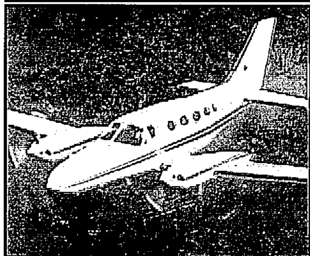
A-I

Beech Baron 55
Beech Bonanza
Cessna 150
Cessna 172
Piper Archer
Piper Seneca



C-I, D-I

Lear 25, 35, **55**
Israeli Westwind
HS 125

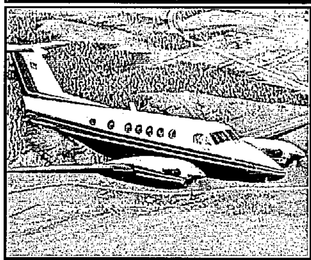


B-I
less than 12,500 lbs.

Beech Baron 58
Beech King Air 100
Cessna 402
Cessna 421
Piper Navajo
Piper Cheyenne
Swearingen Metroliner
Cessna Citation I

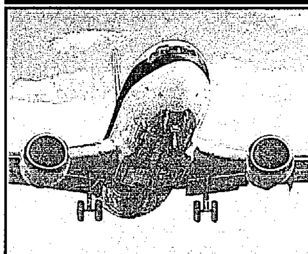
C-II, D-II

Gulfstream II, **III**, IV
Canadair 600
Canadair Regional Jet
Lockheed JetStar
Super King Air 350



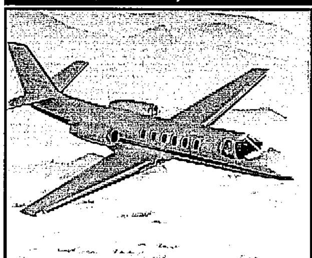
B-II
less than 12,500 lbs.

Super King Air 200
Cessna 441
DHC Twin Otter



C-III, D-III

B 727-200
B 737-200
B 737-300, 400, 500
DC-9
Fokker 70, 100
MD-80
A320

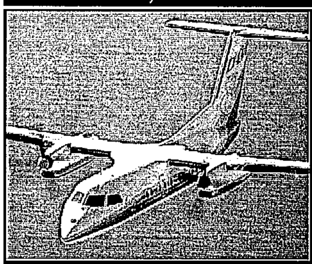


B-I, II
over 12,500 lbs.

Super King Air 300
Beech 1900
Jetstream 31
Falcon 10, 20, 50
Falcon 200, 900
Citation II, III, IV, V
Saab 340
Embraer 120

C-IV, D-IV

B-757
B-767
DC-8-70
DC-10
MD-11
L1011



A-III, B-III

DHC Dash 7
DHC Dash 8
DC-3
Convair 580
Fairchild F-27
ATR 72
ATP

D-V

B-747 Series
B-777

LAUGHLIN BULLHEAD INTERNATIONAL Airport

Exhibit 3D
AIRPORT REFERENCE CODES

As is evident from the table **the current critical ARC is C-III** with just over 500 operations in 1998. This ARC includes the B737-200 and B727-200 currently operated by the primary charter airlines serving the airport.

In the future, larger aircraft in ADG IV, such as the B757 and occasional wide body aircraft, can be expected to utilize the airport. The B757 in ARC C-IV, while widebody aircraft are in C-IV and D-IV. Over the long range planning horizon, adequate operations can be expected for C-IV. Business jet operations in ARC D-I and D-II, however, can be expected to create sufficient approach category D operational levels within the planning period to support Category D standards. **Therefore, it is recommended that Laughlin-Bullhead be planned to ultimately accommodate ARC D-IV.**

RUNWAY REQUIREMENTS

The analyses of the operational capacity and the critical design aircraft is used to determine runway needs. This includes, runway configuration, dimensional standards, pavement strength, as well as navigational aids, lighting, and marking.

RUNWAY CONFIGURATION

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. The airfield capacity analysis indicated that additional runway capacity should be planned for within the long range planning horizon. While some taxiway and navigational aid improvements can provide some increases in capacity, a second runway could be necessary to meet the long range need. A parallel runway would provide the best capacity improvement The design standards for this runway will be considered in later sections.

FAA Advisory Circular 150/5300-13, Change 1, **Airport Design** recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for Airport Reference Codes (ARC) A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; and 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II, and 20 knots for ARC C-III through D-IV.

The most recent wind data specific to the Laughlin-Bullhead International Airport dates back to a ten-year period between 1955 and 1964. This data is graphically depicted on the wind rose in **Exhibit 3E**. As depicted on the exhibit, runway orientation 16-34 provides 96.4 percent coverage for 12 mph crosswinds. Thus, the single runway orientation has adequate wind coverage for all sizes and speeds of aircraft. For this reason, a crosswind runway is not necessary at Laughlin-Bullhead International Airport.

RUNWAY DIMENSIONAL REQUIREMENTS

Runway dimensional standards include the length and width of the runway as well as the dimensions associated with runway safety areas and other clearances. These requirements are based upon the design aircraft. The runway length must consider the performance characteristics of individual aircraft types, while the other dimensional standards are generally based upon the most critical airport reference code expected to use the runway. The dimensional standards are outlined for the planning period for the primary runway as well as for a potential parallel runway to meet future capacity demand.

Runway Length

The aircraft performance capability is a the key factors for determining the runway length needed for takeoff and landing. The performance capability, and subsequently the runway length requirement, of a given aircraft type can be affected by the elevation of the airport, the air temperature, the gradient of the runway, and the operating weight of the aircraft.

For determining runway length requirements at IFP, the airport elevation is 692 feet above mean sea level (MSL). The temperature commonly used for design is the mean maximum daily temperature during the hottest month. At IFP, that is July when the mean maximum daily temperature averages 108.3 degrees Fahrenheit. The runway gradient is 0.93 percent.

The aircraft load is dependent upon the payload of passengers and/or cargo plus the amount of fuel it has on board. For departures the amount of fuel varies depending upon the length of nonstop flight, or trip length.

In 1998, Laughlin-Bullhead International Airport had over 500 annual operations by commercial jet aircraft. These were all charter operations, using B-737-200 and B727-200 aircraft. The destinations vary depending upon charter packages. Destinations extend to Canada and the Midwest.

Table 3D indicates typical longer haul destinations and the air miles from IFP to each. The longest trip length on an occasional basis is to Toronto at 1,939 miles. At 1,308 miles, Minneapolis is the longest trip length on a regular basis with two trips a week.

TABLE 3D
Non-Stop Haul Length
Laughlin/Bullhead International Airport

Destination	Air Miles
Wichita, KS	967
Bellingham, WA	1,025
Minneapolis, MN	1,308
Chicago, IL	1,508
Milwaukee, WI	1,520
Toronto, Canada	1,939

Table 3E outlines runway length requirements of select aircraft for various trip lengths from Laughlin-

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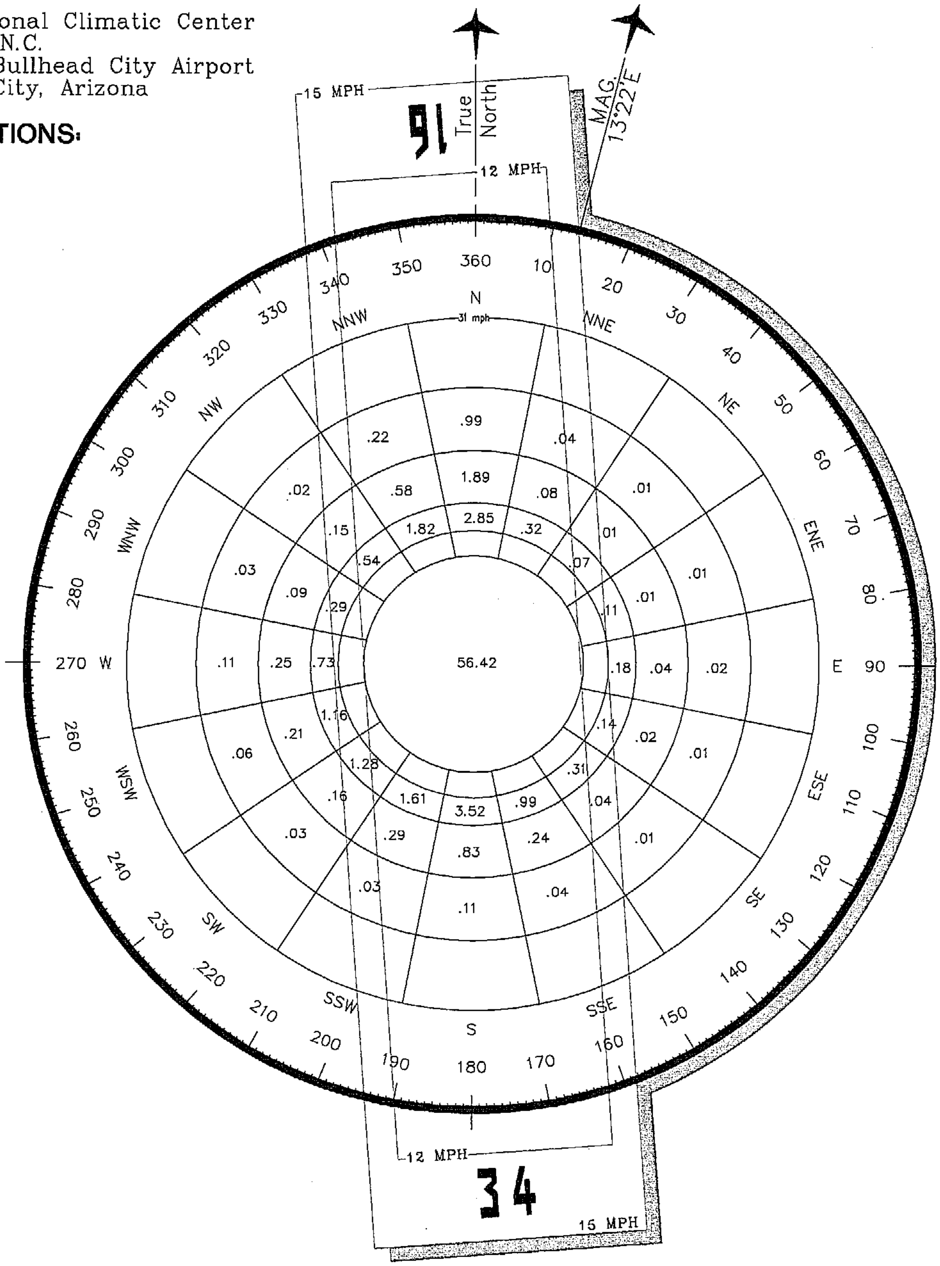
SOURCE:

NOAA National Climatic Center
Asheville, N.C.
Laughlin/Bullhead City Airport
Bullhead City, Arizona

OBSERVATIONS:
1955–1964



ALL WEATHER WIND COVERAGE		
	12 M.P.H.	15 M.P.H.
Runway 16–34	*96.4%*	*98.9%*

LAUGHLIN BULLHEAD INTERNATIONAL Airport

Exhibit 3E
ALL WEATHER WIND ROSE

Bullhead International Airport. It is evident from the exhibit that the B727-200 and B737-300 require the most runway length. Newer aircraft such as the B737-300, B737-700, and B757 require much less length.

TABLE 3E
Runway Length Requirements (ft.)
Commercial Service Aircraft
Laughlin/Bullhead International Airport

	Trip Range			
	(108° F)			93° F
	1,000 miles	1,500 miles	2,000 miles	2,000 miles
B727-200	7,700	9,300	10,500	9,100
B737-200	8,100	9,900	11,100	9,600
B737-300	6,400	7,800	9,000	7,700
B737-700	5,000	5,600	6,500	5,500
B757	5,500	5,900	6,600	5,600
MD 82-88	7,000	8,300	9,300	8,100
MD 81	7,200	8,400	N/A	8,200

Notes: Design Temperature: 108° F - July; 93° F - May
Elevation: 694 ft. MSL
Payload: Full passenger load @ 200 pounds per passenger, including baggage

Sources: FAA Advisory Circular 150-5325-4A, **Runway Length Requirements for Airport Design**; Aircraft Characteristics for Airport Planning (manufacturer source).

The **Airport Noise and Capacity Act of 1990** mandates that by the year 2000, all aircraft weighing over 75,000 pounds must meet Stage 3 noise emission standards. Many airlines are replacing the Stage 2 aircraft such as the B727-200 and B737-200 with the newer Stage 3 aircraft. Another means of achieving Stage 3 standards is by retrofitting or re-engining the aircraft. This is the direction that many charter and cargo airlines have been taking. With the level of charter activity that Laughlin-Bullhead International Airport has now and can expect to grow in the future, it is highly likely that the aforementioned aircraft will continue serve IFP with quieter engines.

To accommodate the B737-200 on a 2,000 mile trip length would require 11,100 feet. A Boeing 727-200 would require 10,500 feet. It is not highly likely that a B737-200 would be making this trip length out of IFP. Regular 2,000 mile trip lengths by the B727-200 could be possible over the long term, but are more likely to occur during the peak charter season between October and May. The hot month during this period is May with an average temperature of 93 degrees F. **Table 3E** indicates the runway length requirements for 2,000 mile trips at this temperature. The B727-200 would require 9,100 feet of runway during May.

A haul length of 1,500 miles would extend to Chicago and Minneapolis, could be experienced in the summer months in the future. The B737-200 would require 9,900 feet of length, while the B727-200 would require 9,300 feet.

If Stage 3 planes are considered, the longest runway length requirement would be 9,300 feet for the MD-82-88 for a 2,000-mile trip. The B737-300 would require 9,000 feet for the same trip.

Another consideration is the runway length requirements of business jets. **Table 3F** outlines the requirements for general aviation aircraft at the design temperature and elevation of IFP. The present runway length of 7,500 feet is essentially adequate to accommodate 100 percent of the business jet fleet at 60 percent useful load. For longer trip lengths, additional runway length could be needed. A length of 9,100 feet will accommodate 75 percent of the business jet fleet at 90 percent useful load. It is not anticipated that a 100 percent fleet at 90 percent useful load would need to be accommodated. This category typically represents long range, international general aviation trips, and are not likely to occur from IFP on a regular basis.

TABLE 3F
General Aviation Runway Length Requirements
Laughlin/Bullhead International Airport

AIRPORT AND RUNWAY DATA	
Airport elevation	694 feet
Mean daily maximum temperature of the hottest month	108.30 F.
Maximum difference in runway centerline elevation	73 feet
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,000 feet
95 percent of these small airplanes	3,500 feet
100 percent of these small airplanes	4,200 feet
Small airplanes with 10 or more passenger seats	4,700 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5,900 feet
75 percent of these large airplanes at 90 percent useful load	9,100 feet
100 percent of these large airplanes at 60 percent useful load	7,700 feet
100 percent of these large airplanes at 90 percent useful load	11,700 feet

REFERENCE: Chapter 2 of AC 150/5325-4A, **Runway Length Requirements for Airport Design**, no Changes included.

While the existing 7,500 foot runway length marginally meets current needs, the Master Plan should consider options that would extend the runway to at least 9,000 feet. This would accommodate the B737-300 on a 2,000 mile trip. This aircraft is anticipated to remain popular and will likely replace older B737-200 as they retire from the charter fleet over the years. Because of the high summer temperatures, and the use of the B727-200 and B737-200 by charter operators, the airport should attempt to maintain the potential to extend the runway to 10,000 feet if a strong demand presents itself in the future.

A parallel runway should be considered to add operational capacity to the airfield after the intermediate planning horizon activity milestone is met. To effectively add capacity, the parallel runway should be capable of serving 80 to 90 percent of the airports operations. A review of the ARC operational mix in **Table 3C** indicates that this can be achieved by planning a parallel runway that can accommodate up to ARC B-II aircraft. From **Table 3F**, this would include small airplanes with 10 or more passenger seats. The runway length design for this category is 4,700 feet.

Pavement Strength

An important feature of airfield pavement is the ability to withstand repeated use by aircraft of significant weight. Runway 16-34 is strength-rated at 75,000 pounds single wheel loading (SWL), 200,000 pounds dual wheel loading (DWL) and 400,000 pounds dual tandem loading (DTL).

The critical aircraft for the design of Runway 16-34 are commercial service aircraft. The B727-200 can have a maximum gross takeoff weight of up to 200,000 pounds on dual wheel gear. The B757 can have a takeoff weight of up to 315,000 pounds on dual tandem gear. As a result, the pavement strength of Runway 16-34 will be adequate for the planning period.

A potential parallel runway should be planned to a pavement strength of 30,000. This would not only serve the capacity needs of the airport, but would also allow the airport to continue to serve commuter aircraft during periods when the primary runway is closed for service.

Dimensional Design Standards

Runway dimensional design standards define the widths, and clearances required to optimize safe operations in the landing and takeoff area. These dimensional standards vary depending upon the ARC for each runway. **Table 3G** outlines key dimensional standards for the airport reference codes most applicable to Laughlin-Bullhead International Airport now and in the future.

The primary runway at IFP should currently be designed to at least C-III standards, the airport's current critical ARC. Planning and development considerations should take into account the potential for D-IV aircraft in the future. A future parallel runway should be planned to B-II standards.

TABLE 3G
Airfield Design Standards
Laughlin/Bullhead International Airport

Airport Reference Code	Current Runway 16-34		B-II (ft.)	C-III (ft.)	D-IV (ft.)
Runway Width	150		75	150	150
Runway Safety Area					
Width	500		150	500	520
Length Beyond End	1,000		300	1,000	1,000
Runway Object Free Area					
Width	800		500	800	800
Length Beyond End	1,000		300	1,000	1,000
Runway Blast Pad					
Width	150		95	200	200
Length	200		150	200	200
Runway Centerline to:					
Holding Position	250		200	250	250
Parallel Taxiway	400		240	400	400
Parallel Runway	N/A		700	700	700
Taxiway Width	75		35	60	75
Taxiway Centerline to:					
Fixed or Movable Object	129.5		65.5	93	129.5
Parallel Taxilane	N/A		105	152	215
Taxilane Centerline to:					
Fixed or Movable Object	N/A		57.5	81	112.5
Parallel Taxilane	N/A		97	140	198
Runway Protection Zones - One mile or greater visibility					
Inner width	1,000	500	500	500	500
Length	1,000	1,700	1,000	1,700	1,700
Outer width	1,100	1,010	700	1,010	1,010
Category I					
Inner Width			1,000	1,000	1,000
Length			2,500	2,500	2,500
Outer Width			1,750	1,750	1,750

Runway 16-34 currently meets virtually all the dimensional standards for C-III aircraft depicted on **Table 3G**. The only area that may be considered under the current design standard is the runway protection zone off the north end of the runway. This is due to a change in the FAA design standard since the previous Master Plan was completed. As indicated in the table, the current design standard calls for an RPZ length of 1,700 feet. The previous standard was a 1,000 foot length. Consequently, the existing property control extends only slightly further than the previous runway protection zone.

Most of the runway dimensions currently in place will be adequate for an upgrade to D-IV aircraft. If a Category I instrument approach minimums are implemented, a larger runway protection zone will need to be planned for that approach. The RPZ's on either end are not currently sized for a Category I approach.

TAXIWAY REQUIREMENTS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield.

As detailed in Chapter One, Runway 16-34 is served by a full length parallel taxiway, and five exit/entrance taxiways on the east side of the runway. With the general aviation facilities currently being relocated to the east side of the airport, this will place all terminal facilities on the east side of the airport. Thus, the existing parallel taxiway will be serving all the landside aviation facilities. Similarly, a parallel taxiway should also be planned to serve any parallel general aviation that may be developed.

Dimensional standards for the taxiways are depicted on **Table 3G**. The existing taxiways associated with the runway currently meet or exceed C-III standards and meet D-IV standards as well. Taxiways associated with a general aviation parallel runway should be designed to B-II standards.

All except one exit taxiway are currently right angle exits. Acute angle or high speed exits can provide the ability for an aircraft to clear the runway faster, thereby increasing efficiency. High speed exits beginning at 5,500 feet to 6,000 feet from the runway threshold would be usable by commercial service aircraft and business jets. Acute angle exits 3,500 feet from the runway threshold would be usable by most aircraft weighing less 12,500 pounds. Taxiway C is the existing acute angle exit. It is located approximately 5,200 feet from the Runway 34 threshold. Additional acute angle exits should be considered for the long range planning horizon.

At a minimum, acute angle exits at 3,500 feet from each threshold should be planned for a general aviation parallel runway. A midfield exit could also be considered.

Bottlenecks can often occur near the takeoff end of a runway when a preceding aircraft is not ready to takeoff and blocks the access taxiway for the aircraft next in line. Holding bays provide flexibility in ground circulation by permitting departing aircraft to maneuver around an aircraft that is not ready to depart. Holding bays are recommended when runway operations exceed 30 per hour. A holding bay is currently available at the south end the runway. Similar holding bay should be considered for the north end of the runway as well as each end of a general aviation parallel runway.

NAVIGATIONAL APPROACH AIDS

Navigational aids provide two primary services to airport operations, precision guidance to specific runway and/or non-precision guidance to a runway or the airport itself. The basic difference between a precision and non-precision navigational aid is that the former provides electronic descent, alignment (course), and position guidance, while the non-precision navigational aid provides only alignment and position location information. The necessity of such equipment is usually determined by design standards predicated on safety considerations and operational needs. The type, purpose and volume of aviation activity expected at the airport are factors in the determination of the airport's eligibility for navigational aids.

The advancement of technology has been one of the most important factors in the growth of the aviation industry in the twentieth century. Many of the civil aviation improvements have been derived and enhanced from initial development for military purposes. The use of orbiting satellites to confirm an aircraft's location is one of the latest military development to be made available to the civil aviation community.

Global positioning systems (GPS) use two or more satellites to derive an aircraft's location by a triangulation method. The accuracy of these systems has been remarkable, with initial degrees of error of only a few meters. As the technology improves, it is anticipated that GPS may be able to provide accurate enough position information to allow Category II and III precision instrument approaches, independent of any existing ground-based navigational facilities. In addition to the navigational benefits, it has been estimated that GPS equipment will be much less costly than existing precision instrument landing systems.

Due to 98 percent VFR weather, Laughlin-Bullhead International Airport needs for instrument approaches are primarily based upon commercial service activity. Currently, IFP has a VOR/DME approach and a GPS approach to Runway 34.. The GPS approach provides the best weather minimums allowing the airport to remain operational with reported cloud ceilings of at least 1208 feet AGL and 3/4 mile visibility. Ultimately, attaining Category I minimums with lower ceilings and of ½ mile visibility should be considered. This can be achieved with either an instrument landing system (ILS), or a future CAT I GPS approach.

A parallel general aviation runway development should also consider the potential for a GPS instrument approach for periods when the primary runway may be closed for maintenance. This would involve ensuring that adequate clearances are maintained in the approaches for minimums of one mile or greater.

Precision approach path indicators (PAPI) provide visual descent guidance information during approach. Runway

16-34 currently is equipped with PAPI-4 for both approaches. PAPI should be planned for a parallel general aviation runway as well.

Two types of automated weather observing systems are currently deployed at airports around the country. ASOS (automated surface observing system) and AWOS (automated weather observing system) both measure and process surface weather observations 24 hours a day, with reporting varying from one minute to hourly. The systems provide near real-time measurements of atmospheric conditions.

ASOS is typically commissioned by the National Weather Service or the Department of Defense. AWOS is often commissioned by the Federal Aviation Administration for airports that meet criteria of either 8,250 annual itinerant operations or 75,500 annual local operations. Laughlin-Bullhead International Airport should be considered for an ASOS or AWOS-3 on site in the future.

IFP is presently served by an airport traffic control tower (ATCT) operated under the Federal Contract Tower Program. Hours of operation are presently 8:00 a.m. to 6:00 p.m. and should increase in the future as operations increase and as scheduled commercial jet activity returns.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Runway identification lighting provides the pilot with a rapid and positive identification of the runway end. The most basic system involves runway end identifier lights (REIL's). REIL's should be considered for all lighted runways not planned for a more sophisticated approach light system (ALS). Currently, REILs are installed at the approach thresholds of Runway 16-34. REIL's should be planned for a parallel general aviation runway as well.

The addition of a full Category I instrument approach is recommended. To achieve the best minimums possible for this approach, a medium intensity approach light system with runway alignment indicator lights (MALSR) is recommended.

The medium intensity runway lighting (MIRL) currently serving Runway 16-34 will be adequate for the planning period unless runway visual range (RVR) is installed with the CAT I approach. In this case, the existing runway edge lighting will need to be upgraded to high intensity runway lights (HIRL). The parallel runway should be planned for at least low intensity runway lighting (LIRL).

Presently the taxiway system is lighted with medium intensity taxiway lighting (MITL) which will be adequate for the planning period. MITL should be planned for all future taxiways as well.

Lighted airfield signage on the primary runway currently meets FAR Part 139 standards. This will need to be extended to any new runway and taxiway facilities.

Precision runway marking should be maintained on Runway 34, as well as the non-precision markings on Runway

16. Non-precision runway markings should be planned for a parallel runways. Basic taxiway marking will continue to be adequate and should be applied to all new taxiways as well.

The airport also presently has a lighted wind cone and segmented circle which provides pilots with information about wind conditions and the airport traffic pattern. In addition, an airport beacon assists in identifying the airport from the air at night. Each of these facilities should be maintained in the future.

PASSENGER AIRLINE TERMINAL

Components of the terminal area complex include the terminal building, gate positions, and apron area. This section identifies the facilities required to meet the airport's needs through the planning period.

The review of requirements for various terminal complex functional areas was performed with the guidance of a Federal Aviation Administration Advisory Circular 150/5360-13, **Planning and Design Guidelines for Airport Terminal Facilities**. Facility requirements were updated to reflect the planning horizon years milestones for enplanements. This included the current level (30,000) as well as milestone levels of 125,000, 200,000 and 350,000 annual enplaned passengers.

Airline terminal area requirements were developed for the following functional areas:

- Gate and Boarding Devices
- Departure Lounges
- Security
- Airline Ticket Counters/Support
- Ticket and Waiting Lobby
- Baggage Claim
- Terminal Services

Following the discussion of these areas, at the end of the chapter is a summary of the terminal building space requirements and a comparison to inventory values. In general. It was found that the current 10,500 square foot terminal is undersized for the design hour passenger levels that it must handle.

TICKETING

The most visible space for the airline is its ticket counter. Airline ticket counter length, counter area, and airline ticket office (ATO) and support (bag make-up and operations) were calculated based upon design hour activity and the number of airlines to be served. The future space needs are shown in **Table 3H**. Ticket counter frontage and area is currently adequate, but virtually any increase in activity will tax the facilities available. The ATO/operations area and queuing area are currently undersized.

GATES AND BOARDING DEVICES

An airline gate represents an aircraft parking position adjacent to a terminal

TABLE 3H Terminal Building Requirements Laughlin-Bullhead International Airport					
		Enplanement Milestones			
	Available	30,000	125,000	200,000	350,000
AIRLINE GATES					
Major	3	2	3	3	4
Regional	1	1	1	2	3
Total Gates	4	3	4	5	7
TICKETING					
Counter Frontage (l.f.)	46	40	75	85	105
Counter Area (s.f.)	370	400	750	850	1,050
ATO/Ops Area (s.f.)	523	3,200	6,000	6,900	8,600
Queue Area (s.f.)	550	800	1,500	1,700	2,150
LOBBY/LOUNGE					
Waiting Lobby (s.f.)	1,295	1,100	2,100	2,400	2,600
Departure Area (s.f.)	438	3,300	6,200	7,000	8,800
BAGGAGE CLAIM					
Claim Display (l.f.)	30	120	225	255	320
Claim Area (s.f.)	720	2,500	4,600	5,300	6,600
RENTAL CAR					
Counter Frontage (l.f.)	32	21	46	56	75
Office Area (s.f.)	304	310	680	840	1,120
Queue Area (s.f.)	192	120	270	340	450
TERMINAL SERVICES					
Food & Drink (s.f.)	1,302	1,700	3,200	3,600	4,600
Shops (s.f.)	600	400	800	900	1,150
Restrooms (s.f.)	650	600	1,100	1,300	1,800
GROSS TERMINAL AREA					
Total Area (s.f.)	10,500*	25,000	55,000	67,000	90,000

* Does not include outside, covered bag claim area.

building and is used by a single aircraft for the loading and unloading of passengers and baggage. At the present time, there are three gate positions available for commercial jet aircraft and one position for smaller regional/ commuter airline use. The major airline gates are currently connected by a secure outdoor walkway to the terminal building. This fenced-in walkway is accessed through a security checkpoint on the east side of the terminal building. The regional airlines gate boards directly from the terminal after passing through a separate security checkpoint on the south face of the terminal building.

In the future, the number of gates needed will be affected by the number of flights and the number of airlines. **Table 3H** summarizes the projected gate requirements through the planning period. The current number of gates available should be sufficient to the 125,000 enplanement level. By the long range planning horizon, four major airline and three commuter gates could be needed. This is a level that the airport has experienced in the past. Future terminal development will need to consider placing the gates closer to the building.

WAITING LOBBY AND DEPARTURE LOUNGE

Public waiting lobby is available for passengers and visitors to co-mingle prior to departure as well as for greetings upon arrival. The present waiting lobby is located in the central area of the terminal building.

Departure lounge requirements depend upon the number of passengers in the departure areas during peak periods. Under the current layout in the terminal building, there is no secured departure lounge other than the two security check rooms. After security processing, passengers proceed to their aircraft. As a result all waiting is combined in the non-secure terminal waiting lobby.

Table 3H outlines the total square footage of waiting lobby and departure lounge that will be necessary based upon projected passenger and gate requirements. The current lobby/lounge area is undersized for some of the charter flights the airport serves today.

SECURITY

Security requirements were examined based upon the current screening procedures: one screening point with one magnetometer at the entrance to each departure lounge. With the capacity of a single unit or station in the range of 500 to 600 passengers per hour, the available screening point should be adequate for the planning period. An additional screening point is provided for the commuter airlines that require screening.

BAGGAGE CLAIM FACILITIES

Baggage claim facility requirements are also depicted on **Table 3H**. Baggage is currently handled at a covered outdoor baggage claim. There is a linear bag drop that serves as the bag claim device. The baggage claim display is currently undersized for the charter activity at the airport. A larger area should be planned with increased activity.

TERMINAL SERVICES

Terminal services include passenger and visitor-oriented amenities, concessions, and services other than those provided by the airlines. For planning purposes these have been broken into food and beverage service, rental car counter area, gift shop, and restrooms. As indicated in **Table 3H** the food and beverage services are presently undersized for the design hour activity at the terminal. The rental car counter office and shop areas are presently adequate, but will be undersized as the 125,000 enplanement horizon is approached. The restroom areas are also marginally adequate, but will need to be enlarged as activity increases.

GROUND ACCESS REQUIREMENTS

Access system facility requirements, based upon demand/capacity relationships, were developed for the system components of access roadway, terminal curb frontage, and vehicle parking. Phased requirements for each component are presented in the following subsection.

TERMINAL ACCESS ROADWAY

The capacity of the airport access and terminal area roadways is the maximum number of vehicles that can pass over a given section of a lane or roadway during a given time period. The capacity or level of service of a facility is affected by a number of factors, including:

- Roadway characteristics
- Traffic factors
- Driver characteristics

The capacity of roadways providing access to the airport as well as the terminal roadway were examined based on the **Highway Capacity Manual** (i.e., **Highway Capacity Manual**, Transportation Research Board, Special Report 209, 1985).

Principal access to the airport is from Bullhead Parkway, a four lane arterial that also serves as a bypass for Bullhead City. There are two entrances from Bullhead Parkway. The north entrance begins as two lanes in two-direction flow. As it approaches the terminal, it changes into a one-way terminal loop around the parking lot. The east entrance runs through Bullhead Airpark. It begins as a four-lane, two-direction road, but reduces to two lanes as it approaches the terminal area.

As activity increases, the capacity of these roadways will be exceeded. At a minimum a four lane access road should be provided with a one way loop in front of the terminal building. At least two through lanes should be provided in the loop road. Access to Bullhead Parkway will eventually need to be signalized as well.

TERMINAL CURB FRONTAGE

The curb element is the interface between the terminal building and the ground transportation system. The length of curb required for the loading and unloading of passengers and baggage is determined by the type and volume of ground vehicles anticipated in the peak period on the design day.

The terminal roadway provides one lane for loading and unloading of passengers. The curb frontage totals 330 feet in length. **Table 3J** presents the curb frontage requirements for the planning horizons. Available curb length will be inadequate by the 125,000 enplanement level. Additional curb frontage will need to be planned beyond the short term.

TABLE 3J
Terminal Curb and Vehicle Parking
Laughlin/Bullhead International Airport

		Enplanement Milestones			
	Available	**30,000**	**125,000**	**200,000**	**350,000**
Public Parking	141	80	200	250	375
Employee Parking	0	15	50	70	105
Rental Car Ready/ Return	42	50	120	150	225
Terminal Curb (l.f.)	330	240	450	510	640

VEHICLE PARKING

Vehicle parking in the terminal area of the airport includes those spaces utilized by passengers, visitors, and employees of the airline terminal facilities. Parking spaces are classified as public, employee, and rental car.

Public parking is located in a surface lot immediately east of the terminal building. This parking lot contains 141 spaces. Currently, employees utilize the public lot. Rental car ready/return parking is provided in a parking lot northeast of the terminal building. There are 42 spaces for ready/return use by the rental car companies.

Table 3J presents the parking requirements for the planning period. Public parking requirements were based upon design day passenger levels. This ratio is adjusted lower than at many airports due to the high percentage of non-local traffic. Public parking is presently adequate, but could become constrained as activity approaches the 125,000 enplanement milestone. An separate employee lot should also be considered as activity grows beyond the short term milestone.

Rental car parking needs depend upon the operational requirements of the rental car agencies. If available, the rental car companies will utilize extra spaces for storage. The further the rental car service and storage is from the airport, the more desirable it is to increase the parking capacity at the terminal. According to the analysis, it would appear that additional rental car ready/return spaces could be utilized today with space requirements increasing over the planning period.

AIR CARGO

As indicated in the previous chapter, the proximity of Bullhead City to Las Vegas limits the potential for service from major air cargo carriers an Laughlin-Bullhead International Airport. Commuter haulers and belly freight and mail will be the norm. A small cargo building and ramp for two to three commuter aircraft will be all that is needed over the planning period. A ramp of 2,500 square yards will accommodate three commuter-size aircraft.

GENERAL AVIATION REQUIREMENTS

HANGARS

The demand for hangar facilities typically depends on the number and type of aircraft expected to be based at the airport. Hangar facilities are generally classified as T-hangars, or conventional hangars. Conventional hangars can include individual hangars or multi-aircraft hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements.

Typical utilization of hangar space varies across the country as a function of local climate conditions, airport security, and owner preferences. The intense summer weather conditions in Bullhead City places a premium on sheltered parking. Weather is not the only factor that influences the demand for hangar storage. The larger, more sophisticated and more expensive aircraft tend to be stored in hangars. Owners of these types of aircraft normally desire hangar space to protect their investment.

Based upon owner preferences, it was estimated that the percent of the piston aircraft to be hangared would gradually grow from 70 to 80 percent. Further, all turbine, as well as rotorcraft aircraft would be hangared at IFP. While turbine and rotorcraft can expect to be stored in conventional hangars it is estimated that 85 percent of the piston aircraft would prefer T-hangars. **Table 3K** depicts the future hangar position preferences at Laughlin-Bullhead International Airport.

The final step in the process of determining hangar requirements involves estimating the area necessary to accommodate the required hangar space. A planning standard of 1,250 square feet per based aircraft stored in T-hangars was used. Planning figures for conventional hangars indicate an area of 1,500 square feet for piston and rotary aircraft and 2,500 square feet for turbine aircraft. These figures were applied to the aircraft to be hangared in conventional and T-hangars to determine the area to be devoted to hangar facility requirements through the planning period. Requirements for maintenance and shop hangar area were estimated at 175 square feet per based aircraft.

Table 3K compares the existing hangar availability to the future hangar requirements. It is evident from the table, there could be a need for additional enclosed hangar storage space in the short term. This space will need to be developed in the new east side general aviation area. There is presently no maintenance hangar space available, although space is being considered for the est side.

AIRCRAFT PARKING APRON

Parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. As discussed in the previous section, approximately 20 to 30 percent of the based piston aircraft owners will still prefer ramp storage over the long range. Therefore, the parking apron should be sized to accommodate this demand through the planning period. FAA planning criterion of 300 square yards per tie-down was used to estimate the ramp area that would be needed for based aircraft.

TABLE 3K
Hangar and Hangar Apron Requirements

	Available*	Current Need	Short Term	Intermediate	Long Range
Based Aircraft					
Piston		54	70	86	108
Turbine		4	7	10	16
Rotor		2	3	4	6
Total		60	80	100	130
Aircraft to be Hangared					
Piston		38	50	64	84
Turbine		4	7	10	16
Rotor		2	3	4	6
Total		44	60	78	106
T-Hangar Positions	31	32	43	54	71
Conventional Hangar	13	12	17	24	35
Total Positions	44	44	60	78	106
Hangar Area (s.f.)					
T-Hangar	38,000	40,000	54,000	68,000	89,000
Conventional Hangar	29,500	22,000	33,000	46,000	69,000
Total Storage	67,500	62,000	87,000	114,000	158,000
Maintenance Hangars (s.f.)	0	10,500	14,000	18,000	23,000

* Assumes existing hangars available on west side will be relocated or replaced in new east side GA area.

FAA Advisory Circular 150/5300-13 suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At IFP, the number of transient spaces required was estimated to be approximately 50 percent of the busy day itinerant operations. This high ratio was used due to the nature of the transient aircraft visiting the gaming casinos in Laughlin. Planning criterion of 500 square yards per aircraft was applied to the number of transient spaces to determine future transient apron requirements. The transient apron space ratio is higher than that of the local apron, because it serves a larger variety of aircraft and is typically designed for taxi-through parking spaces.

The results of this analysis are presented in **Table 3L.** There is approximately 29,500 square yards of parking apron available in the new east side general aviation area. The larger areas of ramp on the west side are planned to be abandoned when GA is relocated to the east side. As shown in the table, the existing east side apron area is inadequate for the existing transient needs. Additional apron will need to be planned to accommodate the future planning horizons as well.

TABLE 3L
General Aviation Parking Apron Requirements

	Available	Current Need	Short Term	Intermediate	Long Range
Non-hangared aircraft	N/A	16	20	22	24
Busy Day Itinerary	N/A	175	220	274	357
Local Ramp Positions	N/A	16	20	22	24
Transient Ramp Positions	N/A	88	110	137	178
Total Ramp Positions	25*	104	130	159	202
Apron Area (s.y.)	29,200	48,800	61,000	75,000	96,000

* Reflects current ramp in east side GA area only.

GENERAL AVIATION TERMINAL

A general aviation terminal can serve several functions including providing space for passenger waiting, pilot's lounge and flight planning, concessions, line service and airport management offices, storage, and various other needs. At most general aviation airports, these functions may not necessarily be limited to a single, separate terminal building, but can also be included in the space offered by fixed base operators for these functions and services. For purposes of this analysis, the space requirements will reflect that of a single, public terminal building. Space provided by airport operators, while decreasing the space requirements of a public terminal, will generally increase the overall square footage requirements because of some duplication of function.

The existing general aviation terminal building is located adjacent on the west side of the airfield and includes 4,500 square feet of space utilized for aviation services. The terminal will need to be relocated to the east side in the future. The methodology used in estimating general aviation terminal facility needs was based on the number of itinerant passengers expected to utilize terminal facilities during the design hour and FAA guidelines. A planning average of 2.1 passengers per itinerant flight increasing to 2.4 passengers per itinerant flight by the end of the planning period was multiplied by the number of design hour itinerant operations to determine design hour itinerant passengers.

Space requirements were then based upon providing 90 square feet per design hour itinerant passenger. **Table**

3M outlines the general space requirements for the new east side general aviation terminal building through the planning period. The current terminal on the west side is marginally adequate. More GA terminal building space should be planned when it is replaced on the east side.

TABLE 3M
General Aviation Terminal Building and Auto Parking

	Available	Current Need	Short Term	Intermediate	Long Range
Design Hour Passengers	N/A	49	68	88	121
Terminal Space (s.f.)*	4,500	4,400	6,100	7,900	10,900
Auto Parking Spaces*	58	64	88	114	157

* Assumes existing facilities on west side will be duplicated on new east side GA area.

GENERAL AVIATION AUTO PARKING

Auto parking requirements for the general aviation facilities were determined as well. Parking spaces were estimated at 1.3 spaces per design hour itinerant passenger. The requirements are depicted in **Table 3M.** There are presently 58 parking spaces on the west side. This is marginally adequate, so additional spaces should be planned with the relocation to the east side.

AIRPORT SUPPORT FACILITIES

AIRPORT RESCUE AND FIREFIGHTING

Requirements for Airport Rescue and Firefighting (ARFF) services at an airport are established under **F.A.R. Part 139.** Part 139.49 establishes an ARFF index determination. The index is determined by the longest index group with an average of five or more daily departures. The airport is currently defined under Index A of Part 139.49. Index A requirements include aircraft up to 90 feet in length. By the intermediate planning horizon activity level, the airport could expect to be classified as Index B.

The ARFF building at IFP is located adjacent to the terminal building and includes two fire trucks and a quick response vehicle. The ARFF is manned by trained and certified airport employees. The existing equipment meets Index B standards and should be adequate for the planning period. As traffic increases, the airport may need to consider a full-time ARFF staff. This would require the addition of living and office space to the ARFF building.

FUEL STORAGE

The Mohave County Airport Authority owns and operates three fuel tanks on the airport. Included in the fuel farm is a 15,000 gallon tank storing 100LL (avgas), and a second 15,000 plus a 12,000 gallon tank for storing Jet A.

Fuel storage requirements are typically based upon maintaining a two week supply of fuel during an average month, however, more frequent deliveries can reduce the fuel storage capacity requirement. Avgas fuel sales at IFP averaged 4.0 gallons per general aviation operation in 1998. Jet A fuel sales averaged 21 gallons per itinerant operation (including air carrier, air taxi, military as well as GA). These ratios were utilized as the baseline to project future avgas sales. Gallons per operation were projected to increase as the aircraft mix grows larger.

Table 3N presents future avgas and Jet A storage requirements for the airport based upon a two week supply during the peak month. Jet A storage will need to be increased in the short term as it presently allows for about a 10-day supply on average. Avgas storage will be adequate until at least the long range planning horizon.

TABLE 3N
Fuel Storage Requirements

	Available*	Current Need	Short Term	Inter-mediate	Long Range
Avgas Supply					
Annual GA Operations		48,617	64,000	80,000	104,000
Average Day Operations		133	175	219	285
Average Fuel Ratio		4.0	4.1	4.2	4.4
Two-Week Supply		7,400	10,000	12,900	17,600
Jet A Supply					
Annual Itinerant Operations		44,419	58,700	73,000	96,800
Average Day Operations		122	161	200	265
Average Fuel Ratio		21.0	24.0	27.0	32.0
Two-Week Supply		35,900	54,000	75,600	118,700
Avgas Fuel Storage	15,000	12,000	12,000	13,000	18,000
Jet A Fuel Storage	27,000	36,000	54,000	76,000	119,000

UTILITIES

Utilities on the airport have been designed and sized to meet the typical needs of a commercial service airport. Water, sewer, power, telephone, and natural gas service are positioned to be extended on demand as the east side of the airport is developed.

Potable water is supplied by the North Mohave Water Company. This company serves approximately 3.5 square miles in the northern portion of Bullhead City. The company pumps 75 acre-feet from the Colorado River annually.

The airport's terminal building currently has a water flow capacity of 975 gallons per minute (gpm). Typically, the major capacity demand at non-hub and small hub commercial service airports is fire flow. This capacity will need to be extended along the east flight line as it develops in the future.

The Bullhead Sanitary District (BSD) provides sanitary sewer services at the airport. Their service area covers 17 square miles in the north half of Bullhead City. The District has developed a treatment facility with 750,000 gallons per day (gpd) capacity. Sanitary sewer collection demands are being met at the airport. As activity grows and more facilities are developed, sanitary sewer services will need to be extended along the east flight line.

Facilities for natural gas, power, and telephone have all been developed to be extended along the east flight line to serve future needs.

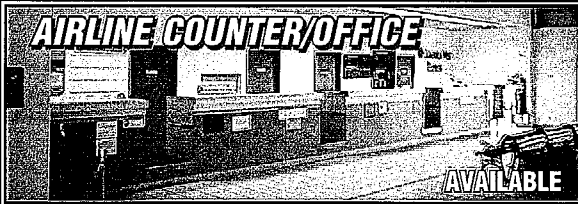
SUMMARY

The intent of this chapter has been to outline the facilities required to meet aviation demands projected for Laughlin-Bullhead International Airport though the long range planning horizon activity milestones. A summary of these facility requirements for the airfield, the terminal building, and for general aviation facilities is presented on **Exhibits 3F, 3G**, and **3H.**

The analysis indicates that IFP will need to provide additional facilities as demand increases in each of these areas. The next step in the planning process will be to formulate and evaluate alternatives to determine the best direction for meeting these existing and future needs. The remainder of the master plan will be devoted to developing this direction, its schedule, and its costs.

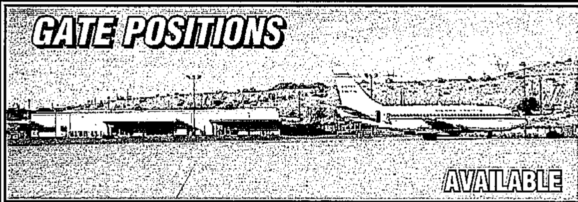
98MP08-3G-9/30/98

AIRLINE COUNTER/OFFICE



	AVAILABLE	30,000	125,000	200,000	350,000
		REQUIREMENTS AT ANNUAL ENPLANEMENT THRESHOLDS			
¥ Counter Length (l.f.)	46	40	75	85	105
¥ ATO/Support (l.f.)	523	3,200	6,000	6,900	8,600
¥ Queue Area (s.f.)	550	800	1,500	1,700	2,150
¥ Waiting Lobby (s.f.)	1,295	1,100	2,100	2,400	2,600

GATE POSITIONS



	AVAILABLE	30,000	125,000	200,000	350,000
		REQUIREMENTS AT ANNUAL ENPLANEMENT THRESHOLDS			
¥ Major Airlines	3	2	3	3	4
¥ Regional Airlines	1	1	1	2	3
¥ Departure Lounge (s.f.)	438	3,300	6,200	7,000	8,800

BAG CLAIM

	AVAILABLE	30,000	125,000	200,000	350,000
		REQUIREMENTS AT ANNUAL ENPLANEMENT THRESHOLDS			
¥ Claim Display (l.f.)	30	120	225	255	320
¥ Claim Area (s.f.)	720	2,520	4,600	5,300	6,600

TERMINAL SERVICES

	AVAILABLE	30,000	125,000	200,000	350,000
		REQUIREMENTS AT ANNUAL ENPLANEMENT THRESHOLDS			
¥ Rental Car Counter (l.f.)	32	21	46	56	75
¥ Food & Drink (s.f.)	1,302	1,700	3,200	3,600	4,600
¥ Shops (s.f.)	600	400	800	900	1,150
¥ Restrooms (s.f.)	650	600	1,100	1,300	1,800

CURB AND PARKING

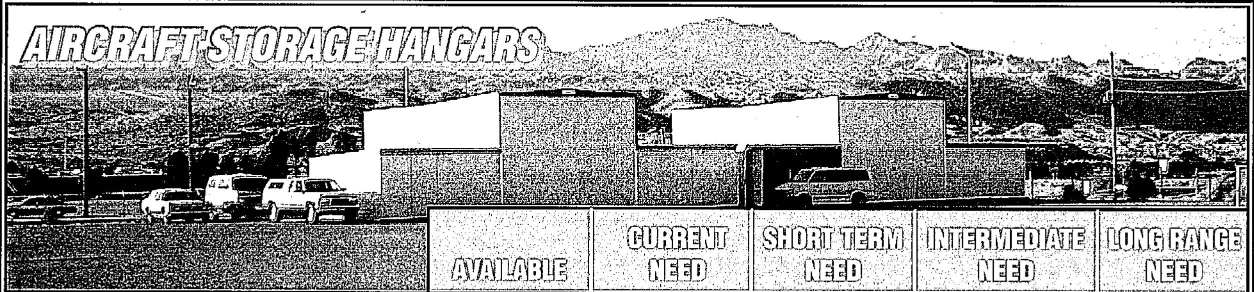
	AVAILABLE	30,000	125,000	200,000	350,000
		REQUIREMENTS AT ANNUAL ENPLANEMENT THRESHOLDS			
¥ Terminal Curb (l.f.)	330	240	450	510	640
¥ Parking (spaces)					
- Public	141	80	200	250	375
- Employee	0	15	50	70	105
-Rental Car	42	50	120	150	225

GROSS TERMINAL AREA (s.f.)	**10,500**	**25,000**	**55,000**	**67,000**	**90,000**

Exhibit 3G
TERMINAL BUILDING REQUIREMENTS

98MP18-3H-10/4/00

AIRCRAFT STORAGE HANGARS

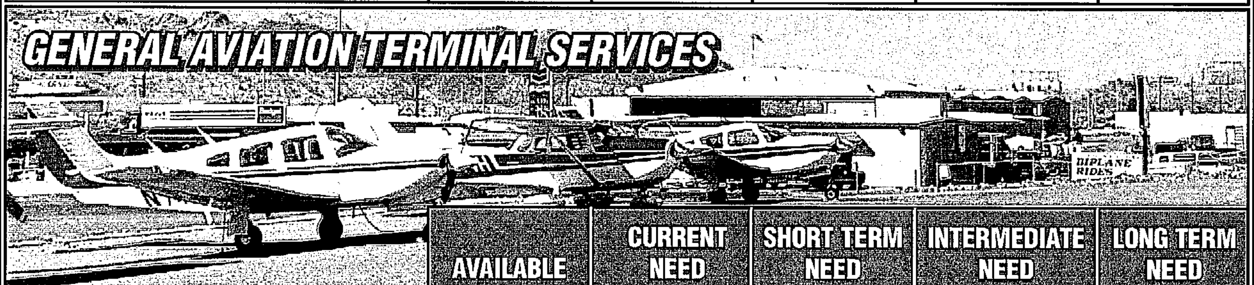


	AVAILABLE	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG RANGE NEED
Aircraft Positions					
T-Hangars	31	32	43	54	71
Conventional Hangars	13	12	17	24	35
Total Positions	44	44	60	78	106

AIRCRAFT APRON

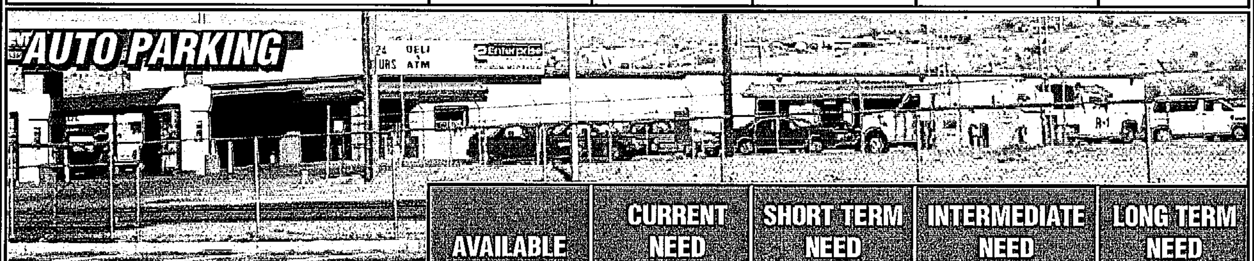
	AVAILABLE	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Local Tiedowns	NA	16	20	22	24
Transient Positions	NA	88	110	37	178
Total	25*	104	130	159	202

GENERAL AVIATION TERMINAL SERVICES



	AVAILABLE	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Terminal Building (s.f.)	4,500**	4,400	6,100	7,900	10,900
Maintenance Hangar (s.f.)	0	10,500	14,000	18,000	23,000
Fuel Storage (gal.)					
Avgas	15,000	12,000	12,000	13,000	18,000
JetA	27,000	36,000	54,000	76,000	119,000

AUTO PARKING



	AVAILABLE	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Parking Spaces	58	64	88	114	157

* Reflects current ramp in east side GA only.
** Reflects west side GA terminal, which will be replaced on the east side.

LAUGHLIN BULLHEAD INTERNATIONAL Airport

Exhibit 3H
GENERAL AVIATION
FACILITY REQUIREMENTS